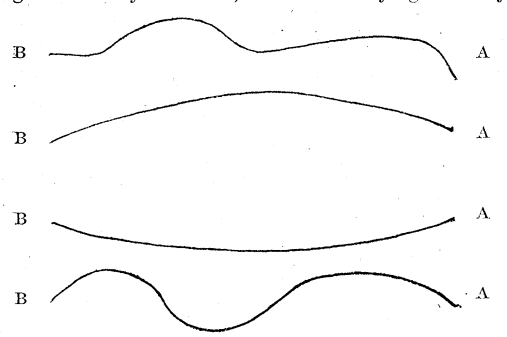
it was a fine adult male, eight feet in length, weighing very nearly one thousand pounds. The specimen was purchased by Dr. G. E. Manigault for the museum at Charleston, S.C., where it is now preserved.

That this species is prone to wander far from its usual haunts — the icefields eastward of Newfoundland and northward — is attested by its capture, not only near New-York City, but also at Cambridge, Md., in an arm of Chesapeake Bay, as recorded some twenty years ago by Professor Cope. The present record, however, is the first of the capture of a positively identified example of any seal on the New-England coast other than the common small harbor seal (Phoca vitulina). J. A. ALLEN.

Flight of the flying-fish.

On a recent trip from New York to Galveston, with the weather at the start cold and chilly, wind north-east, and ending in the Gulf with clear sunny days and summer breezes, there was every opportunity afforded for watching the flight of flying-fish. The first fish were seen two days out of New York; and on every day thereafter, save on one when off the coast of Florida, numerous brown pelicans were observed. Probably the flying-fish found the atmosphere a trifle heavy, flitting about with pelicans for interested spectators, and attended strictly to their domestic duties. The act of flying is somewhat startling, the fish emerging with much energy, and, from the very start, buzzing its wings like a humming-bird; and in no instance did the buzzing cease until the fish disappeared in the sea at the end of its flight. The longest flight observed continued, without any contact with the water, for nine seconds; estimated distance, six hundred to eight hundred feet. In some cases the flight was nearly horizontal; in most cases, however, it was arched vertically. Flying across the wind, it was noticed that contact with the water did not apparently retard the movement of the fish in the air. Some of them made four contacts before finishing the flight. The wind had some effect upon the direction and character of the flying; but fish were noticed going with the wind, and crossing it in every direction, and a few flying directly



against it; A being the starting-points; B, the end, and the line of flight being shown as it appeared from a point in a vertical plane connecting A and B.

GEORGE J. CARNEY.

Lowell, Mass.

Sun's radiation and geologic climate.

It seems to me that Mr. Warring, in his objection (SCIENCE, p. 395) to the assumption that the dissipation of solar energy from loss of heat diminishes the supply of sun-heat received by the earth, has overlooked the very important factor of the variable area of the contracting sun. To make this clear, let

Q = Quantity of heat incident normally on a unit surface in a unit of time, at the earth's distance from the sun.

R = Radiating or heat-emitting power of each physical point of the sun.

A = Area of projected surface emitting heat normally = Area of great circle of sun regarded as a sphere.

Then evidently, at a given distance, we have, Q varies as $R \times A$: hence, taking the example cited from Newcomb (as A varies directly as the square of the sun's diameter), if the temperature of the condensed gaseous mass is doubled by contraction to one-half its primitive diameter, its area (or A) would be reduced to one-fourth its original area; so that, notwithstanding the assumed augmentation of temperature of the sun, the supply of heat received by the earth (or $R \times A$) would not be increased, unless R augmented in a ratio greater than the square of the temperature. It is difficult to assign precisely what function R is of the temperature of the radiating body: some physicists (Rossetti) make it proportional to the square of the absolute temperature; while others (Stephan) make it as high as the fourth power of the absolute temperature.

JOHN LECONTE.

Sphere anemometer.

I am rather amused to see in SCIENCE, p. 228, that Dr. Sprung of Hamburg has re-invented an anemometer well known (but not used) in this country; viz., Howlett's. Dr. Sprung, and all who wish to help forwards our knowledge of wind-force, should begin by making themselves acquainted with what has already been done. In the *Quarterly journal of the meteorological society*, viii., p. 161, will be found an Historical sketch of anemometry and anemometers, by J. K. Laughton, M.A., F.R.G.S., president meteorological society, and in it will be found notices of about two hundred patterns. The full description of Howlett's is given in the *Proceedings British meteorological society*, iv., p. 161; but even Howlett was not the first to use the sphere; for in Mr. Laughton's address he remarks, "The sphere as a pressure-plate at the end of a swinging rod had been suggested, and possibly used, many years before Mr. Howlett's time, as a rude anemoscope. It is mentioned vaguely by Hülse (*Allgemeine maschinen encyclopädie*, under anemometer) in 1841, and is said by Mr. Bender (*Proc. inst. civil engineers*, March 14, 1882) to have been used by Parrot; but this I have not been able to verify." G. J. SYMONS, F.R.S.

62 Camden Square, London N.W.,
May 19, 1883.

SCIENCE AND RELIGION.

Studies in science and religion. By G. FREDERICK WRIGHT. Andover, *Draper*, 1882. 16+390 p. 16°.

WE hail the appearance of a book on this subject by one who is an earnest worker in both theology and science as a sign that the unnatural conflict between these two great departments of thought will speedily abate, and their differences be adjusted on a rational basis. The conflict is, in our opinion, the

result of narrowness and dogmatism on both sides, and will never end, until, on the one hand, theologians not only acquaint themselves with the *facts*, but deeply sympathize with the *spirit* of science, and, on the other, scientific men not merely retain in memory from childish days some extreme forms of religious dogmas, but enter deeply and lovingly into the profound truths which lie at the root of these dogmas. The author certainly deserves the thanks of all fair-minded men for the judicial spirit in which he treats the points in dispute.

As indicated by the title, the book is not a systematic treatise, but rather a collection of essays written at different times, but following a continuous line of thought. Chapter i., as introductory to all the rest, treats of the ground of validity of induction. In this the author shows that both scientific and religious beliefs rest on induction. In both we attain, not demonstrative certainty, but probabilities of all degrees. In both we demand only the best working hypothesis. Having thus in his first chapter laid a foundation, in his second and third he takes Darwinism as an example of scientific induction, and gives a discussion which is so fair that Darwin himself, we are sure, would be satisfied. In the fourth chapter he discusses the question of evidence of design in nature, and shows that Darwinism is not, as some suppose, destructive of the doctrine of design and final causes, but only elevates and ennobles our conceptions of the designer, or, to use his own words, that "there is a divinity that shapes the ends of organic life, let natural selection rough-hew them how it will."

The impression received from reading these chapters is that the author, while not championing the cause of Darwinism, believes that some form of evolution — i.e., the origin of species by derivation with modification — is extremely probable. Yet he clearly sees (as every one ought to see) that the origin of species by derivation need trouble the theologian no more than the origin of any thing else by secondary processes.

In the fifth chapter the author runs a remarkable parallel between Darwinism and Calvinism, showing how both insist on absolute continuity and reign of law, how in both individual ends are sacrificed to general ends, and how both, if carried to extreme, tend to fatalism. In both, also, we are brought face to face with the same irreconcilable antithesis; for, if one strives in vain to reconcile the freedom of man with the absoluteness of God, the other must strive in vain to show how the free will of man is consistent with the invariableness of law. Our own view on this subject is briefly this: there are two modes of viewing nature, which may be called the religious and the scientific. According to the one, God in nature operates nature, but according to regular laws, which we call the laws of nature; according to the other, nature, for all practical purposes, may be regarded as operating itself. Both of these views are, we believe, legitimate. When we deal with nature, we practically must hold the latter; when we retire to the inner sanctuary of philosophic thought or religious emotion, we must hold the former. The one is the necessary work-clothes of our *outdoor life*, which we must put off when we return home to enjoy our *inner life*. For finite man this apparent inconsistency — this daily change of clothing — is the truest wisdom. But those who *will* be logically consistent in detail, even at the expense of one-half of all philosophy, run, on the one hand, into *extreme Calvinism*, or, on the other, into *universal automatism*, — the one a spiritualistic, the other a materialistic fatalism.

Chapter vi. is a really admirable *résumé* of the question of prehistoric man, — his relation to the glacial epoch, and his probable antiquity. This being the field of his own scientific work, the author is here at home; and geologists will read this chapter with especial interest as an authoritative statement of the latest and best views on the subject of the glacial epoch in America, and especially of the course and character of the ice-sheet moraine. In fact, it is to our author, in connection with Professors Chamberlin, Upham, and Lewis, that we are chiefly indebted for tracing the ice-sheet moraine through the United States, and thus generally settling the fact of the former existence of such an ice-sheet.

As to the antiquity of man: while his existence during the latter portion of the quaternary, and his coexistence with a now extinct mammalian fauna, is admitted, yet reasons are given for the belief that the time elapsed since the glacial epoch is much less than usually supposed by geologists. The author thinks that the flooded rivers and lakes which characterized the close of the glacial epoch, and which were undoubtedly seen by man, may not have been more than ten thousand years ago. For our own part, while we believe that some years ago there was too strong a tendency, on the part of many geologists of the uniformitarian school, to stretch the time beyond reasonable limits, yet recently in this country the ten-

dency has been, perhaps, too much the other way. Ten thousand years seems a short time for the completion of such great changes as we find in river-beds, in lake-margins, and in mammalian species.

In the last chapter the author discusses the relation of the Bible to science. Perhaps the time is not yet fully ripe for final adjustment here. But one thing is meanwhile certain: all the harm which has come, or will ever come, of the discussion of this subject, comes only of a narrow, intolerant spirit on both sides. Nothing but good can come of the freest inquiry, if only it is conducted in a simple, reverent, truth-loving spirit.

But as many will think that a reviewer is 'nothing unless critical,' we must find some faults, even if they be but errors of typography, or slips of the pen. Of the former, we find one on p. 329, where 70° instead of 20° from pole is given as the position of the antarctic continental ice-foot. Among the latter, we notice on p. 310 that the bluff-deposit of the Mississippi River is spoken of as the '*orange sand.*' The bluff-deposit is a very fine silt (loess) overlying the coarse orange sand. Again: the transition from paleozoic to mesozoic can hardly be called 'one from water-breathing to air-breathing animals,' since air-breathing insects lived in the Devonian, and air-breathing insects and amphibians were abundant in the carboniferous.

Finally, we should state that the book is illustrated by several plates, which greatly increase its value.

THE TOPOGRAPHICAL MAP OF NEW JERSEY.

A topographical map of a part of northern New Jersey, from surveys and levellings made, and local surveys corrected. By GEORGE W. HOWELL, C.E., and C. C. VERMEULE, C.E. *Julius Bien, lith*, 1882. 87.5 × 88 cm.

ALL of our state geological surveys have been hampered by a lack of topographic maps on which to record and publish their results. The geological maps thus far completed have in nearly all cases been based on compilations of county and other surveys, executed at different times, on different plans, and seldom with sufficient geodetic triangulation to insure accuracy. Representation of mountain form is in nearly all cases excessively incorrect. When careful topographic surveys have been made, they have unfortunately too often followed instead of preceded the geological examination. As it is now too late to go back and perform the work in proper order, the next best plan is at least to carry on topographic surveys wherever possible, and secure, as soon as may be, the good results of a close knowledge of the form of the various states. Such work is going on in New York, and a careful triangulation has been carried across the state; but, with the appropriation at present grudgingly afforded this work, many years must pass before it is completed. New Hampshire has taken advantage of a triangulation executed for it by the U. S. coast-survey, and constructed a large six-sheet map on a scale of two and one-half miles to the inch (1 : 158,400), with contour lines every hundred, and in parts every fifty, feet; but these latter are by no means of final accuracy. This map was issued with geological coloring in 1878; and that part including the White Mountains has been published apart in *Appalachia*, vol. i., uncolored, and also by the surveyor, Mr. H. F. Walling, with hypsometric coloring. Another notable contour-line map is that of 'Morrison's Cove,' surveyed by Mr. R. H. Sanders, to illustrate Mr. Fr. Platt's report on Blair and Huntingdon Counties, Penn. (*Second geol. surv. Penn.*, *T.*, 1881). It is printed in fourteen large sheets, on a scale of sixteen hundred feet to an inch (1 :19,200), or about three and one-half inches to a mile, with contours every twenty feet, and is colored geologically. Being in a region of typical Appalachian form, it has an especial value in showing this remarkably interesting style of mountain surface. A photographic plate from a model constructed from this map by Mr. E. H. Harden has been published (*Proc. Amer. phil. soc.*, xix. 1881), and gives a finer view of the intricacies of Pennsylvanian topography than any thing else that has yet appeared. It is to be hoped that the other models constructed for the Pennsylvania survey may be treated in the same way. A second example of fine topographic work on the same large scale is in the lately issued map of the Panther Creek basin by Mr. R. P. Rothwell (see SCIENCE, p. 310), which makes the first of a series of maps that will illustrate the survey of the anthracite district of Pennsylvania, in charge of Mr. Ashburner. The large number of accurate surveys of private property in this region, and the numerous railroads crossing it, will furnish a valuable basis for the final work of the state geologists, and its interesting form and unique structure will at last find adequate representation.

The topographic map now in course of construction and publication by the Geological survey of New Jersey, under the direction